Section C-5.3.3
YUMA PROVING GROUND, ARIZONA

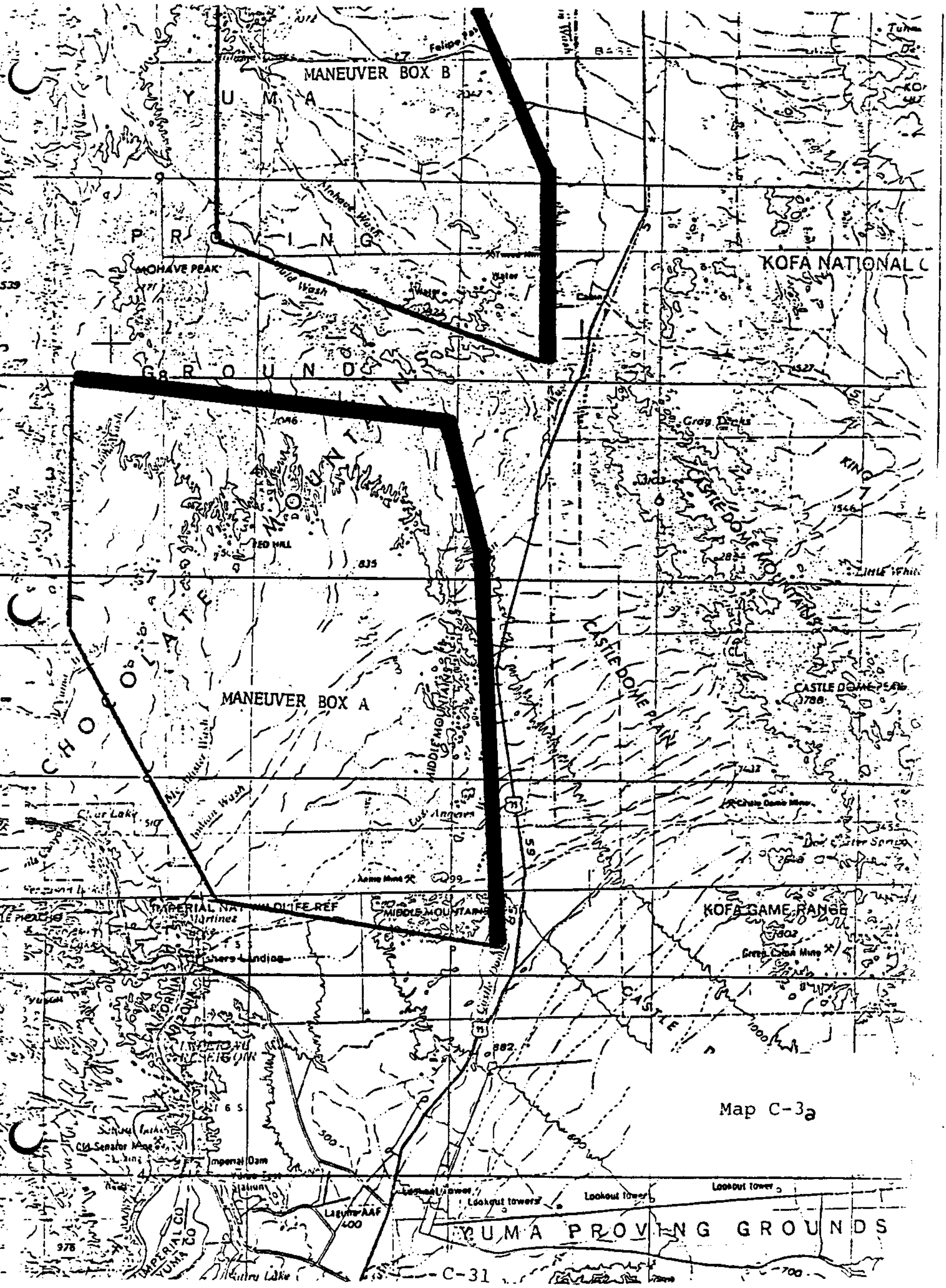
B. LOCATION AND SETTING

Yuma Proving Ground occupies approximately 1400 square miles (1,043,000 acres) of land east of the Colorado River and north of the Gila River in central Yuma County, southwestern Arizona. It is close to the junction of the Colorado and Gila Rivers and is a part of the Sonoran Desert of the southwestern United States and northwest Mexico. The Proving Ground desert area differs from other major world deserts largely in that it is predominately erosional rather than depositional, resulting from its development adjacent to the two rivers. It has the best representative desert environment found in the United States. The terrain is generally characterized by vast low sandy plains interspersed with scattered hills of highly eroded volcanic rock and low, barren, boulder-strewn mountain ranges. The 275 mile perimeter of the Proving Ground enclosures a "U" shaped area. The western side of the "U" is 54 miles long north to south and 12 to 19 miles wide, and the eastern arm of the "U" is 18 miles long north to south and 6 miles wide. Between the arms of the "U", the Kofa Game Range extends 30 miles east to west. Yuma Proving Ground is currently a United States Army Development and Readiness Command installation. If it were decided to locate the proposed National Training Center at Yuma Proving Ground, the United States Army Forces Command would assume management and control of the base let in the fiscal year 1981 (see map, C-3).

The mission of Yuma Proving Ground is to plan, conduct and report the results of development tests on the tube artillery systems, aircraft armament systems, air delivery systems and mobility equipment, and desert environmental testing for all classes of materiel. The firing ranges on the installation can accommodate weapons from small arms up to and including the longest range field artillery and tank cannon.

Military use of the Proving Ground area began early in 1942 with testing near Laguna Dam and with the training maneuvers of General George S. Patton's "Desert Training Command" troops preparing for opeation TORCH -- the invasion of North Africa. Laguna Army Airfield was constructed in connection with the maneuvers.

The organization which was to become Yuma Proving Ground began operations on January 18, 1943, designated as Yuma Test Branch, Corps of Engineers, to test bridges and river-crossing equipment, boats, vehicles, and well-drilling equipment. Office space was acquired from the Bureau of Reclamation at Imperial Dam. On September 25, 1946, Yuma was reclassified as an installation under the Chief of


MANEUVER BOX B
Y U M A
P R O V I N G
G R O U N D
MOHAVE PEAK
KOFA NATIONAL
CHOCOLATE MOUNTAINS
MANEUVER BOX A
CASTLE DOME MOUNTAINS
CASTLE DOME PLAIN
CASTLE DOME PEAK
KOFA GAME RANGE
IMPERIAL NAT WILDLIFE REF
MIDDLE MOUNTAINS
Imperial Dam
Laguna AAF
Lookout tower
YUMA PROVING GROUNDS
IMPERIAL CO
YUMA CO

Map C-3a

Engineers, and a year later the installation was designated Engineer Research and Development Laboratories Yuma Test Branch, Sixth Army.

The site was inactivated in January 1950 because of a military austerity program, but was reactivated on April 1, 1951 to be used for desert environmental testing. It was designated Yuma Test Station and the present Proving Ground mission was defined at that time. By 1953, Yuma Test Station was a $10 million installation, testing everything from tanks to water purification units. By 1955, the post was a $20 million test center with barracks for the soldiers, and some 136 new tenants in family housing. In 1957, more than 200 new housing units were built, with a bachelor officers quarters, swimming pool, gymnasium, fire station, post exchange and numerous other buildings.

On August 1, 1962, Yuma Test Station was assigned to the U.S. Army Materiel Command. On July 1, 1963, Yuma Test Station was redesignated Yuma Proving Ground. Since then, Yuma Proving Ground has added personnel services and test facilities under the Army Military Construction program, to bring the total capital facilities investment to approximately $118 million dollars. Replacement value for the land within Yuma Proving Ground is estimated at $87 million. The total dollar value for equipment is approximately $72.5 million. The year 1970 saw the completion of four test support facilities in the Kofa Firing Range Complex: an instrument calibration laboratory, an inert-loading plant, a high-explosive facility and a jolt-and-jumble facility. A hangar with apron and washrack was also added at Laguna Army Airfield.

From 1970 to the present, further extensive additions and modification have expanded the capabilities at Kofa Firing Range. The water system was improved in 1972 by added storage and distribution construction. A sewage lagoon designed to accommodate 500 persons replaced septic tanks in early 1975. The electrical distribution system is presently being expanded to extend down-range many miles to the east. Four igloo magazine storage structures were completed in August 1973, and others are at the contract stage. A Test Preparation Facility was completed in January 1973, and in early 1974, the 90,000 square feet Weapons Evaluation Facility was dedicated. Currently, some 350 military and 580 civilians are employed at Yuma Proving Ground. There are 720 military personnel and their dependents now living in military housing on the base and 648 military dependents are now living off base in Yuma County.

National Training Center activities at Yuma Proving Ground would be essentially those described for Fort Irwin. However, a large construction program would be needed to build troop, operational and service facilities. (See Table C-11).

C. ENVIRONMENTAL SETTING - NATURAL CONDITIONS

(1) Climate

The Sonoran Desert, in which Yuma Proving Ground is located, is the lowest, hottest, and most varied of North American deserts. The climatic variation over the desert results more from a lack of latitudinally-related lifting of wet air masses than from rain-shadow effects of mountain highlands. Atmospheric moisture is available and occasionally abundant; but reaches the ground as rain, predominantly in the mountains where condensation by localized lifting of air masses compensates partially for the lack of regional lifting.

In the Castle Dome Mountains, 23 miles northeast of the Proving Ground meterological station, yearly rainfall is as much as 10 inches; but at the station it averages less than 3 and one-half inches. Precipitation throughout Arizona is bi-seasonal, occurring largely as light general area storms in the winter and as local erratic, predominantly convectional storms in the summer. Winter in the Yuma area is from about late October through mid-April and approximately half of the yearly precipitation is received during this season. Thunderstorm activity is greatest during the summer: August is the rainiest month, and May the least rainy. Monthly averages can be misleading in that rain falls very sporadically: the average for a given month during a 20-year period may be the average for only two storms which occurred in ohly two of those years. It is obvious, however, that even in the "wettest" seasons and years, the Yuma and Yuma Proving Ground areas are far from wet.

It is equally obvious from temperature records that the Sonoran Desert and Yuma area are hot in the summer. The maximum daily temperature may reach 100 degrees F. in earliest April and continue near or above that into late October -- a duration which has included 72 consecutive days of 100 degrees F. or greater in the Yuma Proving Ground area. The high temperatures derive principally from a regional lack of cloud cover and the consequent impact of strong solar radiation upon essentially barren rock and soil surfaces. The generally light winds do ameliorate the high summer temperatures somewhat. Freezing temperatures occur nearly every winter, even in lowland areas, particularly as a consequence of drainage of cooler air into washes and

Table C-4

NATIONAL TRAINING CENTER

YUMA PROVING GROUND, AZ

FACILITY REQUIREMENT

CAT CODE	FACILITY	REQUIRED	AVAILABLE	SHORTFALL	APPROXIMATE COST ($000)
141-85	Co Admin/Stor (10 EA)	46,000	0	46,000	2,576
171-51	BN HQ & Classroom	13,000 SF	0	13,300 SF	914
214-10	Shop, TAC EQ	18,000 SF		18,000 SF	1,096
		(2 EA)23,625 SF	0	23,625 SF	1,383
214-11	Grease Rack	6 Each	0	6 Each	120
214-12	Oil House	2 Each	0	2 Each	14
214-13	Wash Rack	5 Each	0	5 Each	40
214-14	Dispatcher's Off	2 Each	0	2 Each	24
214-30	Ord Fld Maint Shop	**141,865 SF	S44,419	141,865	7,681
214-23	Wash Rack Tank	5 Each	0	5 Each	40
411-30	Deisel Oil Stor	60,000 Gal	S13,090 Gal		
411-40	MOGAS Stor	90,145 Gal	S91,630 Gal	46,910 Gal	50
422-83	Magazine (40' x 26')	22,758 SF	44,948	0	-
432-10	Warehouse Cold Stg	4,000 SF	S1,599	4,000 SF	350
441-10	Warehouse Gp	**161,000 SF	S65,667	161,000 SF	3,627
721	Bach Enl Qtrs	*** 679 SP	P440/5252	679 SP	5,042
722-10	Dining Fac (500/1000 MN)	14,450 SF	0	14,450 SF	1,530
723-35	BN Stor Bldg	(2 EA) 5,200 SF	0	5,200 SF	156
724	Bach Off Qtrs	*** 14 SF	P50/S23	0	-
610-50	Admin Gen Purp	9,975 SF	S14,530	0	-
740-19	Relg Educ Fac	** 2,000 SF	0	2,000 SF	194
740-21	Commissary Store	** 17,280 SF	S8672	17,280 SF	1,098
740-22	Skill Dev Cen	** 7,600 SF	S5760	7,600 SF	456
740-25	Gen Educ Dev Cen	** 9,825 SF	0	9,825 SF	774
740-32	Guest House	** 7,450	S10263	7,450 SF	471
740-47	Open Mess NCO	** 6,500 SF	6,500 SF	0	-
740-48	Open Mess Off	** 12,000 SF	S7,415 SF	12,000 SF	1,089
740-68	EM Svc Club	** 12,700 SF	0	12,700 SF	1,009
740-90	Shopping Cntr *	** 37,392 SF	0	37,392 SF	2,223
75010	Tennis Court	** 2	1	1	12
				TOTAL	31,969

* Includes: 74023-1624 SF;74059-2224 SF;74056-1936 SF;74053-10,900 SF;74090-2135SF 74020-2224 SF;74012-7800 SF;74011-1524 SF;82190-4400 SF;74055-2625 SF.

** Existing YPG Requirement

*** Req ... needs.

valleys. Temperatures in the mountains correlate well with elevation, decreasing approximately 3.2 degrees F. for each 1,000 feet rise.

The year-round climate of Yuma Proving Ground is characterized by high summer and moderate winter temperatures, low precipitation and relative humidity, clear skies and unlimited visibility, and light surface winds. Within this generalized characterization, however, there are rather high wide yearly, seasonal and even daily variations in many of the climate elements.

Winds above approximately 20,000 feet of altitude in the Yuma area are predominantly from the western quadrant. Below that height the direction varies -- often toward the southerly quadrant in the summer -- in layerings controlled by the influences of other incoming air masses. Surface wind directions at Yuma Proving Ground are modified by the local topography. On a typical summer afternoon, for example, the fetch of surface air is essentially from the Gran Desierto of Northern Mexico, over the Colorado River lowlands, and through the river gap in the eastern rim of the valley. Although comparatively shallow (150-200 feet), the river gap must give the more westerly component to the wind direction at the Proving Ground. Surface wind speeds at the Central Meteorological Observatory are generally light throughout the year, averaging four to six miles per hour. If there is a "windy" season at Yuma Proving Ground, it is during the period from April through August, but it is poorly defined and winds are always unpredictable. Peak windspeeds (gusts) average 16 miles per hour during December through February, 21 miles per hour in March through May, 22 miles per hour in June through August, and 17 miles per hour in September through November. The strongest gust recorded at the Central Meteorological Observatory was 71 miles per hour on March 20, 1970. Gusts above 50 miles per hour occurred in five months during 1954-1973, always with much blowing dust in the air.

(2) <u>Air Quality</u>

Yuma Proving Ground is currently in compliance with federall enforced standards and regulations of the State of Arizona. Primary problems in the future may be from vehicular emissions.

(3) <u>Physiography</u>

Yuma Proving Ground occupies a portion of the Sonoran Desert of the basin and range physiographic province southwest of the Colorado Plateau. The basins north of the Proving Ground commonly are closed and drain internally. On the Proving Ground, however, the basins drain externally into the Colorado and Gila Rivers. Erosion and the removal of weathering debris have been dominant over depositon. The parallelism of short mountain ranges seen throughout much of the basin and range province is less striking in the Proving Ground region. The Castle Dome and Tank Mountains trend 320 degrees to 330 degrees (true); and northwest of the Castle Domes, the Middle, Chocolate, Dome Rock and Trigo Mountains trend dominantly north, but with local westerly and north-westerly alignments. The Western Muggins Mountains trend about 330 degrees, and there is a nonaligned elliptical block at the northeast.

Although the relief of each of the mountain ranges on the Proving Ground is relatively low, the combination of steeply faulted margins, extensive intra-range faulting and jointing, and severe mechanical weathering has produced impressively rugged topography with slopes locally exceeding 40 degrees. Maximum relief ranges from about 980 feet (southern Laguna Mountains to the Colorado River) to 2,578 feet (Dome Rock Mountains to the Colorado River). Relief of the unconsolidated (soil-like) desert-plains materials ranges from 50 feet in the highly dissected gravelly piedmonts fringing portions of all the mountain masses, through a mean of about seven feet in the dissected sandy hills, to a minimum of only inches on the extensive undissected gravelly piedmonts ("desert pavements") and flat-floored washes.

Rainfall runoff is concentrated in the bedrock mountain ravines and lowland washes, commonly occurring as flash floods which overrun roads crossing the washes. Erosion of gravel roads often is extreme, particularly where a road is built up enough to back up the water for a while surfaced roads without culvers often are heavily undercut. Other than in ravines and washes, however, erosion is light. There is literally no erosion, for example, on the extensive, flat desert pavements, where runoff is a sheet of water in essentially laminar flow.

(4) Hydrology

Like Fort Irwin, Yuma Proving Ground has no permanent streams. Surface water flow occurs only after intense rainfall periods, mainly in the form of flash floods. Yuma Proving Ground is near the primary irrigation canal which directs water from the Colorado River to neighboring farmland and uses water from this source to fill the fording test tank. There are 16 wells on Yuma Proving Ground, twelve of which are operating as water sources for various areas and facilities. The maximum potential pumping capacity is 4,334,400 gallons per day. Tank reservoir storage capacity is 1,960,000 gallons. Thus, capacity exceeds demand by a factor of about four. Of the remaining four wells, two are test wells, one is used for flooding during projectile soft-recovery tests, and the one on Cibola Range is unused.

Current water consumption at Yuma Proving Ground is 355,060,000 gallons per year. The capacity of current water sources is 1.6 billion gallons per year, and water supply is not a problem. The fluoride content in water from all present sources is, however, as much as five times greater than that recommended by the United States Public Health Service. The dissolved sulfate, iron, maganese and chloride content also exceeds the recommended standards prescribed by the Health Service. All water supplies are chlorinated, with additional threshole treatment given to the Main Post supply. Several buildings including the school and hospital house water systems that are equipped with individual defluoridation facilities. Bottled drinking water is supplied to all residents on Post (5 gallons per person per week).

(5) Geology

Bedrock occupies about one-fourth of the Yuma Proving Ground. Of that total, volcanic rocks are strongly predominant in the western part of the Proving Ground (Chocolate and Middle Mountains) and in Tank and Palomas Mountains in the northeast. Next in abundance, granitic, gneissic, and schistose rocks occur mostly in the northwestern and southwestern parts of the Proving Ground. Sedimentary and slightly to moderately metamorphosed sedimentary rocks make up most of the northernmost part of the installation. Minor outcrops of intrusive rocks (dikes, for example) and slightly consolidated or indurated alluvial and colluvial materials (fanglomerates, for example) are common in and around the bedrock mountains.

Unmetamorphosed sedimentary rocks at the southwesternmost corner of the Proving Ground adjacent to the Laguna Mountains include sandstones, conglomerates and siltstones. Near the northwest boundary of the Proving Ground, on or against the western flanks of the mountains, are scattered exposures of the unmetamorphosed Bouse Formation, consisting predominantly of calcarous tufa, light-colored sands and silts and calcareous siltstone. The Bouse is considered to be a marine to brackish-water deposit about five million years old which was deposited in an embayment of the Gulf of California just before the Colorado River first began to flow through the area.

Slight to moderately metamorphosed sedimentary rocks are dominant in the Proving Ground portion of the Dome Rock Mountains, prominent in the Middle Mountains, and apparently present in the southern Castle Dome Mountains. In the Dome Rocks, most of the materials are quartzites. In the Middle Mountains, mostly along the western edge, is a sequence of slightly metamorphosed sediments comprising limey siltstone, argillite and graywacke, with some conglomerate, quartzite and limestone.

In more representative parts of the Basin and Range Province (in Nevada, for example), the lowlands are deep, closed structural basins filled with sediments. On Yuma Proving Ground, however, the basins are not closed, and only King Valley and La Posa and Palomas Plains are known to be deeply filled with sands, silts, clays, and small gravels. Castle Dome Plain, southwest of the Castle Dome Mountains, the lowland west of the Middle Mountains and the smaller lowland areas to the north appear to be underlain at relatively shallow depth by bedrock.

Unconsolidated (soil-like) materials transported by water, wind, and gravity movements and residual from weathering of bedrock make up the remainder of the Proving Ground surface. The materials generally are loose and noncoherent; but some cementation by calcium carbonant, other evaporites and iron oxides is common in the desert environment.

(6) <u>Faulting</u>

There are no faults of significance on Yuma Proving Ground.

(7) <u>Seismicity</u>

Yuma is located on the northeast margin of the seismically active Salton Trough of California and Mexico and has experienced frequent seismic shaking and occasional damage. Although no mass earthquake epicenters have been located on faults under the Yuma Proving Ground area, several of the shocks originating to the west and southwest have caused strong shaking at Yuma.

(8) <u>Soils and Terrain</u>

Alluvial lowlands are virtually the only areas used for testing at Yuma Proving Ground. The rolling hills, sandy plains, desert pavements, washes and gullies are the landforms most suitable for testing mobility equipments. Such landforms are, furthermore, representative of the terrinas most frequently encountered in desert military operations.

Desert pavement (known locally as "malapie") is a single-fragment-thick mosaic of stones which armors the surface and inhibits further erosion. It occurs on nearly flat gravelly areas as a result of the leveling of initially low ridges and hunnocks by weathering and small-scale movement of rock fragments, the concentrating of surface stones, and the later development of a soil profile.

Desert varnish is a dark brown to blackish coating on the surfaces of rock outcrops and gravels of appropriate compositon. It is composed principally of precipitates of iron and manganese oxides, with minor silicon and trace compounds. Varnish was apparently formed in times of greater moisture, and its formation is generally considered to have ceased about 2,000 years ago. Varnished desert pavements are ubiquitous on the Proving Ground as broad aprons sloping gently valleyward from mountain margins where vegetation is minimal. They are absent on surfaces of active erosion or recent deposition.

All soils on the Proving Ground are classified by the Soil Conservation Service, Department of Agriculture, as hyperthermic arid, which lack sufficient precipitation to produce crops without irrigation and generally support only sparse stands of desert shrubs, a few trees and perennial grasses.

The erosion and transport soils downslope is light to minimal on the predominant flat and gently sloping gravelly and sandy soil, light to moderate in dissected hilly soil areas, and moderate to heavy in the mountains. In lowlands, transport of materials is along present washes and ravines. The overall drainage pattern is well established and essentially balanced between erosion and depostion. The soils environment is relatively unchanging as long as manmade disturbances and diversions to the natural surface are minimal.

The 275-mile perimeter of Yuma Proving Ground enclosed a "U" shaped area of 1,043,000 acres of which 743,000 are considered to be maneuver area. However, only 288,000 acres (or 28%) of the terrain) are considered suitable for tracked vehicles. The maneuver areas do not measure up to optimum size for National Training Center use.

(9) Vegetation

Vegetation on Yuma Proving Ground consists of the small-leaved (microphyllus) desert scrub and succulents representing an eastward extension of the Mojave and Colorado Deserts in California and the Arizona Succulent Desert, and probably some Mexican Desert flora derived primarily from the dry regions of northern Mexico. Plant life forms are varied, including drought deciduous and evergreen species, trees and shrubs, herbs and grasses, cacti, ocotillo and others.

The Sonora Desert differs from the Mojave, Great Basin and Chihuahan Deserts, in the more conspicuous occurrence of small trees and in the greater variety of plant communities. The trees are markedly concentrated along washes, gullies and hillslope ravines, as "linear aggregations" bordering the present active channel bottoms. The varied species and associations reflect the attraction of differing soil compositions and permeabilities and temperatures and elevations made more or less attractive by localized patterns of rainfall and runoff. These factors of plant occurrence, abundance and provenance determine, in turn, the composition of faunal associations.

Although the Yuma Proving Ground desert has a great variety of plant communities, the number of species constituting many of the communities often is surprisingly limited, and characterization of the associations relatively obvious. When gravels have been exposed for a long time, the surface is a level "desert pavement" of closely packed stones into which surface the occasional rains penetrate no more than 3 inches. Areas of pavement, as much as an acre in extent, may be entirely devoid of vegetation other than a few very small annuals. Other areas support a sparse growth of widely spaced creosote bushes. Distribution tends to follow the intermittent stream channels though some Saguaro cactus may be found clinging in protected niches within the rugged mountainous areas.

The entire Yuma Proving Ground is characterized by crown cover of less than 50% woody vegetation. While there are places where vegetation cover exceeds 50%, they are confined to small areas generally less than one square mile. The narrow bands of riparian vegetation, consisting of saguaros, foothill paloverdes, and ironwoods, typically found in arroyo and wash areas, increase in density just after rainy periods but recede during subsequent exposure to prevailing dry conditions.

When exposures of the underlying sands or deposits of windblown sand abut the pavements, bursage (Franseria) is dominant -- occasionally almost the only specie. There may be scattered ocotillo (Fouquieria), a very few creosote bushes (smaller than those on the pavements), and occasional small palo verde (Cerdidium), or ironwood (Olneya) trees, where the slope of the plain begins to dip from level and runoff waters concentrate slightly. When the dip develops into erosional swales or shallow washes, palo verde and ironwood trees increase in number and size, creosote bushes return in number, and saguaro (Carnegiea gigantea or Cereus giganteus) and a few grasses and different shrubs enter.

Arizona law protects certain plant species, making it unlawful to destroy, mutilate or remove certain living plants from state of public land without a permit. A list of common plants is in Table C-5. Plants protected by state law are listed in Table C-6.

(10) Wildlife

The primary species found on Yuma Proving Ground are coyotes, raccoons, rodents, reptiles and resident and migratory birds. One endangered bird, the Yuma Clapper Rail, and six protected species inhabit the area. (See Table C-10)

Faunal habitats (or life-zones) on Yuma Proving Ground range from the river wetlands with many aquatic, amphibian, terrestrial, and flying forms; to the exposed unvegetated, inhospitable desert pavements; to the sandy plains populated by burrowing small mammals, lizards, snakes, coyotes, foxes, bobcats, and hawks predatory upon the smaller forms; to the rugged hill habitat of the mountain sheep. Deer, wild horse, and burrow traverse all zones from the hills to the rivers.

On or near the Proving Ground are some habitats, unique to the desert environment. Damming of the Colorado River at Laguna and Imperial Dams, for example, created backwater channel, inlets and lakes attractive to indigenous animals and migrating Canada Geese, ducks, and other waterfowl. A field of grain north of Martinez Lake was planted by the Arizona Game and Fish Department to feed migrating birds. Small basins in ravines in the bedrock mountains catch and hold runoff from rains, providing water for many animals. The Game and Fish Department has improved retention in and access to several of these natural "tanks" and has constructed other water catchments in places chosen to influence a more favorable distribution and movement of larger animals.

Yuma Proving Ground is in the path of the Pacific Flyway, the major migration route along westernmost North America. The region also receives some birds from the Pacific Central, Mississippi, and Rocky Mountain Flyways. The Brown Pelican, for instance, occasionally is blown off its more eastern course and into the Yuma region (usually not surviving).

Table C-5

COMMON PLANTS IN THE YUMA AREA
(Source: US Bureau of Land Management, Yuma)

SCIENTIFIC NAME	COMMON NAME	ABUNDANCE
Acacia greggii	Catclaw Acacia	Scattered
Agropyron sp.	Indian Wheatgrass	Scattered clumps
Allenrolfea occidentalis	Iodine-bush	Scattered clumps
Atriplex lentiformis	Saltbush	Sparse
Bebbia juncea	Sweetbush	Sparse
Carnegiea gigantea	Saguaro	Abundant
Cercidium floridum	Blue Palo Verde	Scattered
Cercidium microphyllum	Foothill Palo Verde	Scattered
Dalea spinosa	Smoke-tree	Sparse
Distichlis sp.	Salt grass	Sparse
Echinocactus sp	Barrel Cactus	Scattered
Encelia farinosa	Brittlebush	Scattered clumps
Encelia frutescens	Green Brittle Bush	Scattered clumps
Fouquieria splendens	Ocotillo	Scattered
Franseria ambrosioides	Ambrosia bursage	Fair
Franseria dumosa	White bursage	Sparse
Funastrum heterophyllum	Climbing Milkweed	Sparse
Calliandra eriophylla	False-mesquite	Scattered clumps
Grayia spinosa	Hopsage	Sparse

ℓ21

SCIENTIFIC NAME	COMMON NAME	ABUNDANCE
Hilania rigida	Bunch grass	Scattered clumps
Hymenoclea salsola	Burrobush	Sparse
Hyptis emoryi	Desertlavender	Sparse
Larrea tridentata	Creosote Bush	Abundant
Lycium sp.	Lycium	Scattered clumps
Olneya tesota	Ironwood	Scattered
Opuntia basilaris	Beavertail cactus	Scattered clumps
Opuntia bigelovii	Bigelow's cholla	Scattered clumps
Opuntia fulgida	Silver cholla	Abundant
Opuntia versicolor	Staghorn cactus	Scattered clumps
Phragmites communis	Common Weed	Abundant (C. River)*
Pluchea sericea	Arrow Weed	Scattered clumps
Populus fremontia	Cottonwood	Sparse
Prosopis juliflora	Mesquite	Scattered clumps
Prosopis pubescens	Screwbean Mesquite	Scattered clumps
Salix goodingii	Willow	Abundant (C. River)
Scripus californicus	Bulrush	Sparse
Scirpus olneyi	Great bulrush	Abundant (C. River)
Simmondsia chinensis	Jojoba	Scattered clumps
Tamarix pentandra	Saltcedar	Abundant (C. River)
Typha domingensis	Cattail	Abundant (C. River)

*C. River = Colorado River

Table C-6

PLANTS PROTECTED BY ARIZONA STATE LAW

1. Protected Native Plants

a.	Washingtonia filifera	Fah Palm
b.	Lysiloma Thornberi	Ornamental Tree
c.	Cursera fagaroides	Elephant Tree
d.	Lophocerus Schottii	Senita
e.	Lamaireocereus Thurberi	Organpipe Cactus
f.	Toumeya papyracantha	Paper Spined
g.	Toumeya Peeblesiana	Navajoa
h.	Pediocactus Paradinei	Bristly Plains Cactus
i.	Neoevansia digutic	Dahlia Cactus

2. Protected Families

ALL Species of:

a.	Liliaceae	Lily Family
b.	Amaryllidaceae	Amaryllis Family
c.	Orchidaceae	Orchid Family
d.	Crassulaceae	Orpine Family
e.	Cactaceae	Cactus Family

3. Protected Genera

ALL Species of:

a.	Aquilegia	Columbine
b.	Lobelia	Lobelia
c.	Dodecatheon	Shooting Star
d.	Primula	Primrose
e.	Fouquieria	Ocotillo

4. Protected Species

a.	Atriplex hymenelytra	Desert Holly
b.	Cercis Occidentalis	Western Redbud
c.	Dalea spinosa	Smoke Tree
d.	Holacantha Emoryi	Crucifixion Thorn
e.	Fremontis californica	Flannel Bush
f.	Pinus aristata	Bristle Cone Pine

453

The Kofa Game and Imperial Wildlife Refuges, continguous with the Proving Ground, protect the biotic communities in those areas.

The list of mammals, birds, and reptiles for the Proving Ground (Tables C-6, C-8, and C-9), are from the Fish and Wildlife Management Plan for the installation, prepared in cooperation with the Arizona Game and Fish Department. A list of threatened or endangered species is in Table C-9.

D. ARCHAEOLOGIC RESOURCES

Man's use of the region including Yuma Proving Grounds appears to have been continuous for as long as 10,000 years. Nine archaeological sites on the installation have been identified, described briefly, and photographed; and there are many others not formally recognized. Of the nine, a few are of enough possible significance that their acceptance in the National Register of Historical Places seems likely.

The geography and topography of the region, as well as the types and distribution of cultural remains, suggests that the Proving Ground was on or near two migration routes of early peoples of the American continent. "Trade trails" of the Hohokam, Shoshonean, and Yuma Indians also cross installation land. From artifactual material observed and collected, a tentative sequence of Indian "industries" (or cultures), particularly for southern Calfornia and Nevada and for western Arizona has been established. In the lower Colorado River and Yuma area, the sequence includes the oldest San Dieguito culture, the Amargosa, and the most recent Yuma culture.

The San Dieguito culture comprised two phases in the Yuma area; together of such duration that the tool-making technology progressed from the use of wooden spears to the use of wooden darts tipped with flaked stone points and propelled by a wooden throwing stick called the atlatl. Such progress may have taken a few thousand years. The San Dieguitan people were migratory hunters travelling in groups of several persons, and camping on the low rocky terraces and "desert pavements" of the Colorado and Gila Rivers and of tributary drainages. The people occupied the region during times when the climate was more humid and the present dry washes carried enough water to support an abundance of game to be hunted. The culture seems to have disappeared abruptly; possibly because of the onset of an arid cycle, or because it was displaced or assimilated by the succeeding Amargosa culture.

Table C-7

Mammals, Yuma Proving Ground

SCIENTIFIC NAME	COMMON NAME	HABITAT	ABUNDANCE
Canis latrans	Coyote	Wet land	Abundant
Castor candensis	Beaver	Wet land	Common
Citellus harrisii	Yuma Antelope Squirrel	Open land	Very common
Dipodomys merriami	Merriam Kangaroo Rat	Open land	Very Common
Equus assinus	Wild Burro	Open land	Small number
Equus caballus	Wild Horse	Open land	Small number
Lynx rufus	Bobcat	Open land	Common
Microtus californicus	Long-nose Bat	Open land	Common
Mephitis mephitis	Striped Skunk	Wet land	Common
Neotoma albigula	White-throat Woodrat	Wet land	Common
Neotoma lepida	Desert Wood Rat	Open land	Very common
Odocoileus hemionus	Mule Deer	Open land	Often seen
Ovis canadensis	Bighorn Sheep	Open land	Ocassionally seen
Perognathus amplus	Arizona Pocket Mouse	Open land	Common
Perognathus eremicus	Cactus Mouse	Open land	Common
Procyon lotor	Raccoon	Wet land	Abundant
Sylvilagus audoboni	Desert Cottontail	Open land	Common
Taxidea taxus	Badger	Open land	Common
Urocyon cinereoargenteus	Gray Fox	Open land	Common

Table C-8

Birds, Yuma Proving Ground

SCIENTIFIC NAME	COMMON NAME	HABITAT	ABUNDANCE
Agelaius phoeniceus	Redwinged Blackbird	Open	Abundant
Branta Canadensis	Canadian Goose	Wet land	Occasional
Callipepla gambelii	Gamble's Quail	Open land	Abundant
Cathartes aura	Turkey Vulture	Open land	Common
Charadrius vociferus	Killdeer	Open land	Common
Laterallus jamaicensis	Black Rail	Wet land	Rare
Otus asio	Screech Owl	Open land	Common
Rallus longirostis	Yuma Clapper Rail	Wet land	Endangered
Sturnella neglecta	Western Meadowlark	Open land	Common
Tyrannus verticalis	Western Kingbird	Open land	Common
Zenaida asiatica	White-winged Dove	Open land	Common
Zenaidura mocroura	Mourning Dove	Open land	Common

Table C-9

Reptiles, Yuma Proving Ground

SCIENTIFIC NAME	COMMON NAME	HABITAT	ABUNDANCE
Callisaurus spp.	Gridiron-tailed Lizard	Open lands	
Coluber (or Moastigorphis) spp.	Racer	Open lands	
Gopherus agassizi	Desert Tortise	Open Lands	
Heloderma suspectum	Gila Monster	Open lands	
Phrynosoma spp.	Horned Toad	Open lands	Common
Pituophis spp.	Bull Snake	Open lands	
Sistrurus (or Cotalus) spp.	Rattlesnake(S)	Open lands	Common
Thamnophis spp.	Garter Snake	Open lands	

14

Table C-10

THREATENED WILDLIFE WHOSE REGIONAL
BOUNDARIES INCLUDE THE YUMA AREA

COMMON NAME	SCIENTIFIC NAME
California Brown Pelican	Pelecanus occidentalis californicus
Southern Bald Eagle	Haliaeetus L. leucocephalus
Prairie Falcon	Falco mexicanus
American Peregrine Falcon	Falco peregrinus anatum
Yuma Clapper Rail (Endangered)	Rallus longirostris yumanensis
California Black Rail	Laterallus jamaicensis conturniculus
Spotted Owl	Stirix occidentalis

There are three kinds of San Dieguitan material evidence: cleared and/or boulder-rimmed circles ("house" sites or "sleeping circles"); stone implements, the earliest crudely formed from river pebbles modified by percussion, or later by pressure-flaking; and large ceremonial alinements drawn on the dark desert pavements. There are many cleared circles and a few boulder-rimmed circles on the Proving Ground. In and around them, no artifacts have been found, suggesting that the sites were merely temporary bedding platforms of a roving people. The absence of food-preparation artifacts particularly leads to this conclusion, and with the absence of other artifacts, to the general conclusion that the San Dieguitans were remarkably unsettled and primitive. Some stone implements, probably of the earlier phase, are so crude that deliberate manufacture (as opposed to incidental use or natural formation) is uncertain. Other implements are clearly man-made, and suggest a progressive technological refinement. Many pieces are coated with a dark "desert varnish" of iron and manganese oxides which implies a greater age for them than for the unvarnished stone pieces of succeeding cultures.

No intaglios or rock pictographs have yet been found on the Proving Ground. Just west of the northwest part of the installation, however, a set of large intaglio figures and designs occurs on varnished desert-pavement terraces near the Colorado River. Ancient trails criss-cross terraces and low foothills, leading to no present water source or distinctive feature of landscape. Along the trails are occasional "trail shrines" (piles of cobbles placed one-by-one by travelers): cobble cairns in clusters or without pattern occur here and there, often in passes, with no relationship to trails.

The Amargosa culture appears to have succeeded the last San Dieguito during a regional climate shift from moist to more arid. Details of the characteristics of the Amargosa culture in the Yuma area are somewhat nebulous.

There are no Amargosa artifacts along trails or on terraces of the Colorado and Gila Rivers: there also are no latest San Dieguito artifacts. Possibly the Amargosans preferred sandier homesites near seed sources (grinding or milling stones for seeds, as well as for pigments, appear first at Amargosa sites). The Amargosa created no intaglios or stone pictographs, but some petroglyps and cave paintings. Percussion flaking was, surprisingly, cruder than San Dieguitan, and the undersides of stone objects lying on the soil lack the ferruginous "ground patina" of older stone materials.

There is some question as to whether the Amargosa culture is truly distinct in itself, or is just a continued development from earlier San Dieguito. There are, in fact, many questions regarding cultural character and sequence in the Yuma area. There are relatively fewer questions regarding Yuman culture in the Yuma area, largely because its people probably settled there only a little more than 1,000 years ago, left a more abundant legacy of artifactual remains, and are today represented by living descendants. The people were seed-gatherers, possibly farmers, and not roving hunters with few material possessions. They lived mostly in sandy valley bottoms, moving seasonally into the hills along well established trails and littering them with pieces of pottery broken.

As seed-gatherers, the Yumas made and used thick rock-slab grinding platforms (metates) with, often large smooth handstones (manos). Metates commonly are found broken (sometimes in small piles) -- clearly intentially because they are in no way fragile. Recent Yumans wore deep, nearly cylindrical mortars in bedrock (usually volcanic tuff) around natural water holes such as Mohave and White Tanks on the Proving Ground. Such use of the immediate environs of the few watering sites in the desert mark the Yumans as seed-gatherers -- no hunter would so defile animal drinking places.

Yuman-age trails are quite easily differentiated from earlier Amargosa and San Dieguito trails. Because they are more recent and used for a shorter time, they are less entrenched and stones in them lack desert varnish. Differentiation may be a little more difficult if older trails are followed by present-day deer, horse, or burros. Trails lead to present water sources and show the broken-pottery debris of family movements. Trail shrines are common. Recent Yuman trails crossing trails of earlier cultures may have a line of stones blocking the movement of the spirits of the ancient travelers. Trails which lack broken pottery are the few long trade routes and war-party trails, which were traversed only by men.

The Yuma peoples made alined-rock pictography portraying recognizable human and animal forms as well as abstract designs. They presumably also pecked designs on boulders and rock faces.

The most distinguishing trait of the Yuman culture is the occurrence of pottery (usually the Yuman red ware). Cobble hearths were found near the Yuma Proving Ground Pyrotechnic Evaluation Range in the eastern part of the KOFA Firing

Range. This site in King Valley reportedly gave up 30 metates to collectors. The potentially richest archaeological site surveyed on the Proving Ground is in the Tank Mountains, evidence of probable occupation from San Dieguito through Yuma times has been found.

In the interest of protecting known sites from the casual collector or rock-hound, locations of the sites are retained by the environmental office of Yuma Proving Ground.

E. AIR SPACE

The primary users of the electromagnetic spectrum in the area are the Unied States Air Force, the United States Marine Corps, and the Army itself. One minor airway lies 10 nautical miles south of the reservation and one parallels the reservation on the north. While careful coordination would be required, full power jamming operations could be carried out.

Yuma Proving Ground lies within R-2307 Restricted Area air space. Extensive air operations are currently conducted with no problems. Interoperability with "Red Flag" are Nellis Air Force Base would be difficult (200 nautical miles). Close air support is available from Luke Air Force Base (95 nautical miles) and Davis Monthan Air Force Base (175 nautical miles).

There is no current study information regarding noise levels and standards for Yuma Proving Ground. However, the City and County of Yuma is preparing a study due the end of August, 1978. Use of Yuma Proving Ground for National Training Center activities should not create new problems in this area.

F. SOCIOECONOMIC SETTING

(1) General

The community complex of Yuma Proving Ground is located 30 miles northeast of Yuma, Arizona, the closest civilian community. Yuma Proving Ground is entirely within Yuma County.

Yuma County is located in the southwest corner of Arizona and the United States, abutting the State of California to the west and the Republic of Mexico to the south. The County contains 9,991 square miles of desert, low mountains and irrigated farm lands. The population, which has increased by approximately 151 percent since 1950, is supported by agriculture, military and other U.S. Government agencies, tourism, manufacturing, and retail trade. The outlook for continued growth of Yuma County is strong. With the added dimensions in economic activity and the interest in the economy of the state, there will be continued expansion of Yuma County.

Yuma, the county seat, in the extreme southwest of the county, is Arizona's seventh largest city. With a population of 9,145 in 1950, the city grew 229 percent by 1976.

The Greater Yuma area is estimated to be in excess of 55,000 people and encompasses a trade area in excess of 250,000. Served by Interstate 8, the main line of Southern Pacific Railroad, and an international airport, Yuma is approximately the mid-point and largest city on a line connecting Tucson and Los Angeles. The city of San Luis, Sonora, Mexico with an estimated urban population of 100,000 is approximately 25 miles south.

Parker, 117 miles north of Yuma on the Colorado River,is the other of the two fastest growing population centers in Yuma County. Parker had a population of 1,948 in 1970, and has experienced an 18 percent growth to 1976 at an estimated population of 2,300. It is an excellent recreation area with emphasis on water sports. Fifteen miles down stream from Parker Dam, the rivers offers year-round fishing and boating. Presently, 5,000 acres of Indian Reservation are available for industrial or commercial leasing.

Somerton is located eleven miles north of San Luis, Mexico on United States Highway 95. The 1976 estimated population is 3150. Somerton's economy is based on agriculture.

Wellton, located 30 miles east of Yuma on Interstate Route 8, was incorporated in 1970 with a population of 967. It is an important agricultural area of 75,000 acres of irrigated farmland.

Adequate housing and community support facilities are available to support the military and civilian workers of Yuma Proving Ground who must live off post. A recent reduction in force has lessened the work force impact on Yuma.

(2) Education

There are twenty elementary and two high schools in the Yuma, Somerton and Gadsden area. Education in and around Yuma is well supported.

Yuma schools show an enrollment growth of 29.6 percent during the period 1970-1975 against a total population growth of 20.7 percent in Yuma County. In 1975-76, 14,635 of the students resided in the Yuma Trade Area. The public schools are currently considered to be full by local standards, even though enrollment figures show a decline in the past two years of approximately 3,000 students. Yuma also offers degree work at Western Arizona State College, and the University of Arizona and Pepperdine University both conduct extensive off-campus educational programs.

(3) Community Services

(Reference: Economic Development Department, Yuma County Chamber of Commerce, Yuma, Arizona)

The City of Yuma is a Charter government city headed by a Mayor and six member council. Functioning under them are a City Administrator, and appointment of a City Attorney, Financial Officer and City Recorder.

The city operates three fire stations with a fourth station to be added shortly in the Yuma Valley. The present staff is 65. The fire apparatus operated by the Fire Department are four 1,000 GPM Pumpers, one 1,250 GPM Pumper and one 1,500 GPM Pumper, one 65' Aerial Ladder with a 100' Aerial Ladder to be added in the 1977-78 fiscal year, one Rescue Truck, and assorted command utility service type vehicles. The Yuma Rural/Metro Fire Department, Inc. is the recognized fire department for the Yuma County area and serves areas beyond the east, south, and west of Yuma city limits. The Department operates ten fire vehicles from two stations with 26 fully-trained, full-time, on-call personnel. The Yuma area is served by three law enforcement agencies: the Federal Bureau of Investigation maintains an area office; Yuma County Sheriffs Department has 43 personnel; and the Yuma Police Department has a total of 88 personnel, 25 vehicles, and a new and modern facility.

Industrial, commercial and domestic water is supplied to the consumer by the City of Yuma Water and Sewer Division. An abundant and reliable water supply is assured the city of Yuma through firm rights to flow of the Colorado River. The City system has the capacity to process and deliver in excess of 21 million gallons daily. Peak daily requirements have reached 16.2 million gallons.

Yuma has a modern activated sludge treatment facility for treating wastewater in primary and secondary stages. The plant's 6.1 million gallon daily capacity is designed for a population of 75,000. Provision for expansion of plant capacity was incorporated in the initial design.

Arizona Public Service Company, an investor owned utility, serves both electric power and natural gas in the City of Yuma and environs. The primary source of electric power in the Yuma area is from the 2,085 MW Four Corners Generating Station which is interconnected with the 161 KV USBR transmission network at Parker, Arizona. One-third of the 75 MW capacity to the Yucca Plant in Yuma is allocated to the immediate Yuma area. Two 20.5 MW and two 60 MW natural gas turbines are used for peaking. Electric power is delivered to substations over a 69 KV network. Natural gas transmission mains serve Yuma from the El Paso Natural Gas Company pipeline 80 miles north of Yuma. BTU content range is 1040 to 1080. The Arizona Corporation Commission has placed a moratorium on new connect and expanded loads to the system. Mountain Bell Telephone Company, provides telephone service to the entire City of Yuma and its Arizona trade area.

Yuma has the normal banks, motels and shopping centers associated with a town of its size. Recreational facilities include three swimming pools, five parks, lighted ball fields, ten tennis courts,two golf courses, five theaters and the library. Yuma also has a commercial airfield with scheduled airline service.

Yuma Regional Medical Center is an acute care, general hospital with a licensed capacity of 220 beds and full medical and surgical facilities. Yuma also has a licensed convalescent center and an ambulance service.

G. YUMA PROVING GROUND FACILITIES

Yuma Proving Ground is a compact community in a moderate to hilly setting. It has all the normal military post facilities except for a hospital.

(1) Housing and Services

There are 46 spaces of bachelor housing in a permanent barracks. Temporary barracks can house 673 more troops.

Married personnel are housed in 290 units varying from two to four bedrooms, and eight trailer homes.

Currently, some 350 military and 580 civilians are employed at Yuma Proving Ground. Were National Training Center to displace the current testing mission, the Army permanent party would range up to 2,374 military and 318 civilians. The 2,692 employee total would increase the permanent employee population at Yuma Proving Ground by more than 1,700 or almost 200%. While the total military jobs would increase, civilian jobs would decrease by 262. If the number of government quarters were to remain the same initially, the number of dependents living off-post would be from 4,000 to over 4,500 persons.

Base services include a chapel, an exchange and a commissary, a nursery, a child care center, and a credit union. An Army health clinic provides for immediate medical needs, and clubs are available for all personnel. There is a bowling center, gymnasium, athletic fields, a theater, craft shops and a swimming pool. A nine-hole golf course completes the recreation scene.

(2) Utilities

The capacities of utilities plants are adequate for expansion to support the proposed action (National Training Center - Alternative Site Analysis). Ninety-five percent of the power comes from Parker-Davis and the Colorado River Storage Project of the United States Bureau of Reclamation. Five percent of the power comes from the Wellton-Mohawk Irrigation and Drainage District of the Arizona Public Service Company. Telephone service is provided by Mountain Bell.

There is an early elementary (kindergarten through fourth grade) school on-base which serves 138 military dependent children. Other military children attend the Yuma County schools.

(3) Sewage Treatment and Disposal

The sewage collection and disposal system consists of approximately 89,474 lineal feet of vitrified clay and asbestos-cement pipe, sized from 8-inch to 12-inch. Building services are 8-inch and 6-inch with some 4-inch cast iron. All branch lines collect in mains leading to either septic tanks or sewage lagoons. Approximately 319 million gallons per year enter the sewage systems, and there is no surface sewage flow from the installation. The current capacity is estimated by base engineers at 547 million gallons per year.

(4) Solid Waste Disposal

Five thousand tons per year are deposited on Site Seven. That site has a capacity of 300 acres, of which twenty have been used since 1969.

H. RELATIONSHIP OF THE PROPOSED ACTION TO LAND USE PLANS, POLICIES AND CONTROLS

Yuma Proving Ground is comprised of land withdrawn from the public domain specifically for use by the United States Army for the test evaluation of ordnance materiel and other defense uses. Therefore, the proposed National Training Center usage coincides with the overall mission of Yuma Proving Ground. The scale of the proposed construction and operation of the ranges is such that it will not violate air quality standards even though some pollutants will be emitted from equipment, vehicles, and test items. The Federal Water Pollution Control Act Amendments of 1972 is not applicable to this project because the area is devoid of any water source such as a river or stream and the nature of the action does not involve production of surface water effluents. The proposed action would not create violations of the Clean Air Act and Federal Water Pollution Control Act Amendments of 1972.

I. THE PROBABLE IMPACT OF THE PROPOSED ACTION ON THE ENVIRONMENT

Insofar as is practicable, operational planning and execution would be conducted so as to eliminate potential problems and to minimize those which are unavoidable. However, certain impacts would occur and are discussed below.

(1) Air Quality

The extended use of tracked vehicles as envisioned for the National Training Center operations would increase the airborne particulate matter and photochemical oxidants. Over time, as desert pavements are destroyed, and increased amounts of airborne dusts would be generated. Seasonal dryness during some of the exercises may be expected to generate large amounts of dust. Silt grains may be expected to be carried a great distance before being redeposited. Since rainfall is so limited in the lowlands where most maneuver will take place, this condition will prevail during 10-11 months of the year. Areas of planned concentration of troops and equipment would require special consideration. Despite continuing emissions from gasoline and diesel powered tracked and wheeled vehicles, the use at Yuma Proving Ground for military exercises is not expected to have serious effects of ambient levels of oxidants, carbon monoxide, oxides of sulfur or oxides of nitrogen. Oxides of sulfur and nitrogen would be added to the atmosphere by weapons firing in amounts which cannot be quantified due to the dispersion of the troops. Considering the nature of the area where the firing occurs, the air volume and movement, and the intermittent nature of the firing, it is considered unlikely that these contaminants will have a measurable effect on ambient air quality. The quality of the biosphere within the area is not expected to suffer a significant adverse effect.

(2) Hydrology

Since water sources are all deep wells, there would be no chance of pollution from National Training Center operations. Yuma Proving Ground is currently using more water than the amount which would be needed for National Training Center activities, assuming conservation measures were enforced. Even allowing for possible greater use of water because of the intense heat of the Sonoran Desert, the water supply at Yuma should be more than adequate for the proposed activity.

(3) Sewage Treatment and Disposal

Sewage treatment facilities at Yuma Proving Ground would be overloaded by National Training Center needs if the housing on base were increased to accommodate all military personnel and dependents. If only existing military housing were used and the balance of military and dependents lived in Yuma County, the base sewage system would be adequate. The County system has the capacity to handle the consequent increase in population.

(4) Geology

National Training Center operations are not expected to effect the geologic setting at Yuma Proving Ground.

(5) Soils

The operation of wheeled and tracked vehicles over the area may have a long-term effect on the soils. At present, there are many tracks visible on the ground surface. The tracks from Patton's tanks are still very noticeable 35 years later.

There would be some increased rates of erosion where the surface "crust" or desert "pavement" is broken. Water transport in, down, and across slope tracks, and wind erosion in broken "pavement" areas can be expected. Inspection of older tracks shows that once the fine sands are eroded the "pavement" merely heals with a track imprint in it.

(6) Vegetation

Ground and aerial (helicopter) inspection of the areas indicated have shown that in areas where vehicles tend to follow in the same trail, the area becomes denuded of all vegetation and major roads are established. In areas where it appeared that only several vehicles had traveled, damage to the vegetation appeared to be minimal with annuals appearing in the older tracks. When vehicles, both large-wheeled and tracked, make sharp turns, they displace large amounts of soil and vegetation. This action would inhibit recovery of scrub-type vegetation. Endemic species of vegetation would be affected in the maneuvering areas and especially in the bivouac areas where the land can be expected to be denuded of all vegetation. Cutting of scrub-type vegetation for camouflage could also have an adverse impact on the sparse species. Additionally, the destruction of vegetation around springs, watering holes and/or where it is used as nesting, roosting sites, and protection would have an impact on wildlife. The destruction of vegetation in the areas where much of the movement would be conducted would have an adverse impact on the wildlife except for rodents and reptiles. Because of the scarcity of rainfall in the lowlands, damage done to the vegetation, especially the larger plants, would take two to three generations to overcome.

(7) Wildlife

It is believed that vehicular traffic may have an adverse effect on rodents and reptiles. Many of the species live in burrows under the mantle of the desert floor and may be crushed; affecting not only on the species, but possibly on the predators which prey upon them. The disturbance of rocky formations, caves or deep crevices could have an impact on the wildlife inhibiting the area, particularly the reptiles which are ectothermic and may not be able to find new cover in time for survival. Vehicular traffic in the desert floor and valleys would have an impact on not only the rodents and reptiles living in subsurface burrows but also the raptors. Any collecting, killing or undue harassment of any species of wildlife will have an impact, not only on that species, but also on others in the ecosystem.

A severe depletion or alteration of the vegetative resources of the bajadas, flats and foothills would significantly affect ungulates (mule deer and bighorn sheep) as well as the smaller mammals, birds and reptiles. Movements of mule deer and bighorn sheep, which are dynamic and not significantly restricted by present Yma Proving Ground activities, would likely be disrupted by National Training Center activities. The bighorn sheep is listed by the Arizona Game and Fish Department as a species whose status in Arizona may be in jeopardy in the near future. Implementation of the National Training Center would put additional stress on certain bighorn herds residing on the Proving Ground and could jeopardize their continued existence.

(8) Archaeologic Resources

Although damage to sites by vehicle travel is likely to be inadvertent, some risk of disturbing or destroying significant archaeological material is present in National Training Center maneuvers. A much greater risk is deliberate disturbance of sites and archaeological material by persons hunting for artifacts for personal possession. Preservation of the sites nominated for the Register would require specific measures to be taken.

J. SOCIOECONOMIC IMPACT - YUMA COUNTY

Locating the National Training Center at Yuma Proving Ground and displacing the present testing operation would cause an increase in the current base-related population (military civilian and their families) of an estimated 4,000 to 5,000 persons. Most of the impact of this change would be felt by the greater Yuma area and would represent a 9% population growth. The influx of military personnel, accompanied by the net loss of 262 civilian jobs, would initially create certain problems in the area. Most affected would be the housing market and the public school system, unless facilities on base were expanded.

If current Yuma Proving Ground operations were to be phased out, there would still be a severe shortage of on-post housing, particularly for families. The local community does not have vacant housing to accommodate the need. Consequently, both a military and civilian construction effort would be needed to house the permanent force. A study of the Yuma area has indicated that, given enough time for construction, the need for additional housing could be met. Homes are currently being built on demand and not developing in large tracts. However, tracts have already been approved which could accommodate National Training Center needs. There are two projects on the eastern side of Yuma which could handle the entire influx. In 1977, some 600 building permits were issued, and the housing market is currently stable. Furthermore, an increase in payrolls and construction work would have healthy impact on the economy.

Although Yuma County schools held approximately 3,000 more students in 1974-75 than last year, they are presently considered to be full by local standards. Approximately 600 additional children would impact the school system by the year 1984. This need would have to be met by adding to the existing school facilities. Again, given enough time, this could be accomplished.

The Yuma County area economy is based on agriculture and tourism, and does not have a particularly strong job market. An increased demand for goods and services would be beneficial in the long run, and the demand for construction, mainly for housing and school facilities, would eventually subside.

K. PROBABLE ADVERSE ENVIRONMENTAL EFFECTS WHICH COULD NOT BE AVOIDED

(1) Air Quality

Small amounts of oxides of sulfur and nitrogen would be added to the air as a result of weapon firing and bombing. Vehicular and aircraft exhaust emissions and dust raised by ground traffic would be wide spread, but should dissipate rapidly with prevailing winds.

(2) Soils

The compaction of surface area in the tracks of vehicles, the accelerated erosion from the "channelization" effect of runoff waters in vehicle tracks, and the aeolian removal of disturbed topsoils, would all have a localized long-term effect on soil stability.

(3) Vegetation

Due to vegetation destruction and root damage, a significant loss in plant productivity may be expected. Also a decrease in productivity would result from the construction of new roads and bivouac areas. Further, soil compaction and roadside water runoff would have a deleterious effect on plant productivity. In heavy maneuver areas, significant uprooting and destruction of ground cover, shrubs, and small trees would occur. The reduction and/or loss of local communities of endemic vegetation also would occur at campsites and in mountain passes. All of this, together with the loss of mature tree stands by crushing with mechanized equipment, and camouflaging requirements, would have an impact on the vegetation.

(4) Wildlife

The disturbance of wildlife and the destruction of subsurface burrows of rodents and reptiles is expected to have a short-term effect. In addition, this short-term impact would effect the birds of the area. The increase in noise levels and activity during the exercises may frighten and shock wildlife, making them easy prey for predators, and the cumulative effect of loss of prey in the food chain may result in a long-term reduction of wildlife numbers.

(5) Archaeologic Resources

The removal of souvenir artifacts and the possible inadvertent destruction of sites not recognizable to anyone but trained specialists may destroy archaeological evidence. The destruction of open sites may occur from the breaking open of new roads and trails in previously undisturbed areas.

(6) Mitigation Measures

The major problems of dust pollution could be reduced considerably by application of a soil stabilizer in the equipment staging areas, all main access roadsides, exits to field roads, and the airfield. A soil stabilizer could be applied as needed to achieve desired dust control on all main dirt roads. Ripping or discing or harrowing of all identifiable camptites or bivouac areas would be accomplished as required. This farming technique is required to reduce compaction and enhance water percolation from rainfall. Such actions would mitigate soils and vegetation damages.

The use of the existing main roads and trails to the maximum extent tactically feasible would considerably reduce vehicular damages to wildlife, soils and vegetation. Strict control and restriction of nonoperational traffic and maintenance and supply vehicles to existing roads would further reduce environmental damages. Vehicular traffic, particularly tracked vehicles, would avoid making fast, sharp or spinning turns to reduce the heavy displacement of soils and vegetation; and extreme caution should be taken to avoid hitting and driving over the large shrubs, especially the Yucca plant.

Discipline of personnel in intervals between tactical engagements would offset unnecessary damage to all natural and cultural resources in the exercise area.

4121

L. THE EXTENT TO WHICH THE PROPOSED ACTION FORECLOSES FUTURE OPERATIONS

No permanent restriction to later changes in land use are foreseen due to Army and air operations of the National Training Center.

M. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

Labor resources would be expended in the construction of maintenance and living facilities, the rehabilitation of other facilities, and in range targetry installation. If current test operations were moved, labor expended to build the test plant would be wasted. Materiel resources would also be expended in construction and rehabilitation projects. The replacement of targets should be a major expenditure. Fuels expended would be within the range expenditure for normal unit training if the National Training Center were not established. The removal of vegetation by establishing new roads or tracks will affect wildlife habitats. In addition, the soil compaction resulting from new roads or trails can permanently alter local drainage patterns with erosion. The possible destruction or degradation of potentially significant archaeological sites and disturbance of surface material would be an irreversible and irretrievable loss of cultural resources.

N. NATIONAL DEFENSE CONSIDERATIONS

It is the position of the Secretary of the Army and the Chief of Staff that a large National Training Center should be developed which would be capable of physically supporting the Army's combined arms tactical unit training while simultaneously integrating similar exercises with the Air Force, Navy and Marine Corps in one location.

The benefits accruing to the National Defense through use of Yuma Proving Ground would be offset to a degree by loss of the area for testing. However, testing could take place at another site. Relocating Yuma testing activities to another area would be very costly and cause an impact on the environment and economy of that area.

O. BENEFITS OF ALTERNATIVES THAT USE FORT IRWIN, CALIFORNIA

Since it is not feasible for both Army and the current mission to use Yuma Proving Ground concurrently, the use of Fort Irwin in place of Yuma Proving Ground would avoid a socioeconomic impact on the towns in Yuma County. This impact would be considerable due to the lack of housing existing on-base. There is, moreover, no requirement to transfer ongoing operations at Fort Irwin to another site with an incumbent environmental effect at the new site. Both active Army and Guard operations can be accommodated concurrently at Fort Irwin.

Fort Irwin is currently used by both the active Army and the California National Guard for tracked vehicle maneuvering while Yuma Proving Ground is used only for testing. Establishing the National Training Center at Fort Irwin changes only the intensity of use of the terrain but would change both the intensity and type of use of the terrain at Yuma Proving Ground. The impact to the land might be greater at Yuma because of the true desert setting.